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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/905,398	07/14/2001	Nace Layadi	120747/075903/001	3744

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EXAMINER

MAI, ANH D

ART UNIT

PAPER NUMBER

2814

DATE MAILED: 08/26/2002

Please find below and/or attached an Office communication concerning this application or proceeding.

# Office Action Summary

Application No.

09/905,398

Applicant(s)

LAYADI ET AL.

Examiner

Anh D. Mai

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

## Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

## Status

- 1) ☒ Responsive to communication(s) filed on 29 July 2002.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

## Disposition of Claims

- 4) ☒ Claim(s) 1-18 is/are pending in the application.
- 4a) Of the above claim(s) 13-18 is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1-12 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

## Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 14 July 2001 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- 11) ☐ The proposed drawing correction filed on \_\_\_\_\_ is: a) ☐ approved b) ☐ disapproved by the Examiner.  
If approved, corrected drawings are required in reply to this Office action.
- 12) ☐ The oath or declaration is objected to by the Examiner.

## Priority under 35 U.S.C. §§ 119 and 120

- 13) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).  
a) ☐ All b) ☐ Some \* c) ☐ None of:  
1. ☐ Certified copies of the priority documents have been received.  
2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.  
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).  
\* See the attached detailed Office action for a list of the certified copies not received.
- 14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).  
a) ☐ The translation of the foreign language provisional application has been received.
- 15) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

## Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892) 4) ☒ Interview Summary (PTO-413) Paper No(s). 5
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948) 5) ☐ Notice of Informal Patent Application (PTO-152)
- 3) ☒ Information Disclosure Statement(s) (PTO-1449) Paper No(s) 2. 6) ☐ Other:

## DETAILED ACTION

### *Election/Restrictions*

1. Applicant's election with traverse of Group I, claims 1-12 in Paper No. 6 is acknowledged. The traversal is on the ground(s) that the proposed method does not form the device as claimed "polish stop layer disposed over the dielectric layer". This is not found persuasive because the Office had unintentionally omitted a step "depositing a second polish stop layer over the planarized structure", thus, polish stop layer is disposed over the dielectric layer. Clearly, another method is capable of making a same device as claimed.

The requirement is still deemed proper and is therefore made FINAL.

### *Claim Rejections - 35 USC § 102*

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

(e) the invention was described in-

(1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effect under this subsection of a national application published under section 122(b) only if the international application designating the United States was published under Article 21(2)(a) of such treaty in the English language; or

(2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that a patent shall not be deemed filed in the United States for the purposes of this subsection based on the filing of an international application filed under the treaty defined in section 351(a).

2. Claims 8 and 10 are rejected under 35 U.S.C. 102(b) as being clearly anticipated by

Konecni et al., (U.S. Patent No. 6,069,072).

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With respect to claim 8, insofar as the device is concerned, Konecni teaches a chemical mechanical polish (CMP) stop layer comprising one of titanium aluminum nitride (TiAlN) and titanium carbon nitride (TiCN) disposed over an underlying substrate. (see col. 1-8).

Note that, the stop layer of Konecni comprises titanium aluminum nitride (TiAlN) and titanium carbon nitride (TiCN) thus, it capable of a function as claimed.

With respect to claim 10, the percentage weight of carbon in the TiCN layer of Konecni is within the claimed range.

3. Claims 8, 9, 11 and 12 are rejected under 35 U.S.C. 102(b) as being clearly anticipated by K. Hieda et al. *Low Temperature (Ba,Sr)TiO<sub>3</sub> Capacitor Process Integration (LTB) Technology for Gigabit Scaled DRAMs*. (IEDM 1999, pp. 789-792) or Meikle et al. (U.S. Patent No. 5,231,306).

With respect to claim 8, insofar as the device is concerned, Hieda and Meikle teach a chemical mechanical polish (CMP) stop layer comprising titanium aluminum nitride (TiAlN) disposed over an underlying substrate.

Note that, the stop layer of Hieda and Meikle comprise titanium aluminum nitride (TiAlN) thus, it capable of a function as claimed.

With respect to claim 11, insofar as the device is concerned, Hieda teaches a plasma etch stop layer comprising titanium aluminum nitride (TiAlN) disposed over an underlying substrate.

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Note that, the stop layer of Hieda comprises titanium aluminum nitride (TiAlN) thus, it capable of a function as claimed.

With respect to claims 9 and 12, the percentage weight of carbon in the TiAlN layer of Hieda is within the claimed range.

4. Claim 1 is rejected under 35 U.S.C. 102(e) as being clearly anticipated by Brennan (U.S. Patent No. 6,211,072).

Brennan teaches a semiconductor device as claimed including:

a substrate (12) having a device feature formed thereon;

a dielectric layer (20) disposed over the substrate (12) and device feature and having at least one contact hole (24) formed therein;

a polish stop layer (28) disposed over the dielectric layer (20) and within the contact hole (24);

a layer of tungsten (26) disposed over the polish stop layer (28) within the contact hole (24) and formed a plug; and

wherein the polish stop layer (28) comprises titanium carbon nitride (TiCN). (see Fig. 5).

### ***Claim Rejections - 35 USC § 103***

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person

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having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

5. Claims 1-5 and 7 are rejected under 35 U.S.C. 103(a) as being unpatentable over Yamashita et al., (JP. Patent No. 08-107148) in view of Meikle et al., (U.S. Patent No. 5,231,306).

With respect to claim 1, Yamashita teaches a semiconductor device substantially as claimed including:

- a substrate (21) having a device feature formed thereon;
- a dielectric layer (28) disposed over the substrate (21) and device feature and having at least one contact hole (29) formed therein;
- a polish stop layer (30) disposed over the dielectric layer (28) and within the contact hole (29);
- a layer of tungsten (31) disposed over the polish stop layer (30) within the contact hole (29) and formed a plug; and
- wherein the polish stop layer (31) comprises titanium nitride (TiN). (See Fig. 9).

Thus, Yamashita is shown to teach all the features of the claim with the exception of using TiAlN or TiCN for the polish stop layer (31).

However, Meikle teaches that aluminum doped TiN are known in the art to be used in place of TiN.

Therefore, it would have been obvious to one having ordinary skill in the art at the time of invention to form the polish stop layer (31) of Yamashita comprises TiAlN as taught by Meikle because TiAlN material is more resistant to diffusion than TiN.

With respect to claim 2, the device of Yamashita further includes a metal coating under the dielectric layer (28), in view of Meikle, aluminum doped TiN can be used in place of the TiN layer (27).

With respect to claim 3, the dielectric layer (28) of Yamashita comprises SiO<sub>2</sub>.

With respect to claim 4, the metal coating of Yamashita comprises an ARC.

With respect to claims 5 and 7, the barrier layer of Meikle comprises TiAlN and appears to have aluminum percentage weight as claimed.

6. Claim 6 is rejected under 35 U.S.C. 103(a) as being unpatentable over Yamashita '148 and Meikle '306 as applied to claim 1 above, and further in view of Konecni '072.

Yamashita and Meikle teach all the features of the claim with the exception of using carbon doped TiN material in place of the TiN layer.

However, Konecni teaches that TiAlN or TiCN are known in the art to be used in place of TiN.

Therefore, it would have been obvious to one having ordinary skill in the art at the time of invention to form the polish stop layer (31) of Yamashita using TiCN material as taught by Konecni because the TiCN material is a good electromigration resistance.

Further, the barrier layer of Konecni comprises TiCN and appears to have a percentage by weight of carbon as claimed.

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***Conclusion***

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Anh D. Mai whose telephone number is (703) 305-0575. The examiner can normally be reached on 8:30AM-5:00PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Olik Chaudhuri can be reached on (703) 306-2794. The fax phone numbers for the organization where this application or proceeding is assigned are (703) 308-7722 for regular communications and (703) 308-7722 for After Final communications.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is (703) 308-0956.

A.M  
August 21, 2002



PHAT X. CAO  
PRIMARY EXAMINER